

Arctic Icebreaker Coordination Committee

NSF Arctic Research Support & Logistics

NSF Program Manager: Dr. Frank R. Rack
Tel: (703) 292-2678; Email: frack@nsf.gov
(responsible for RSL projects in Alaska & on vessels)

U. S. Coast Guard Station, Rainer Room
Alaskan Way, Pier 36, Seattle, WA
January 10-11, 2018



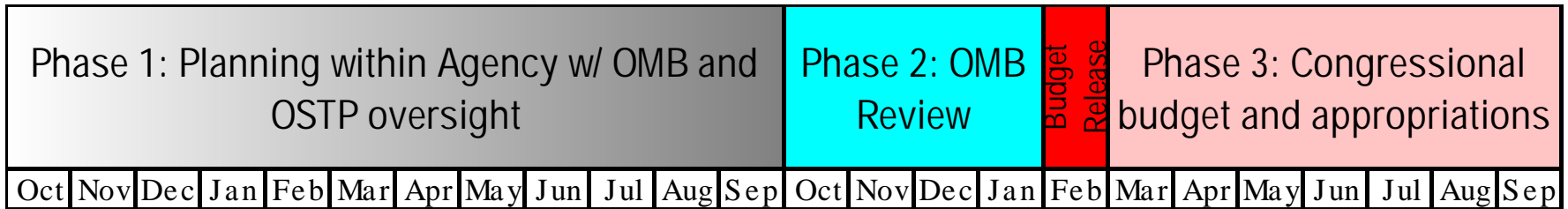
Outline

- **NSF Budget Status**
- **Plans for *Polar Star*, *Healy*, *Sikuliaq***
- **Other Ships in use by NSF/Arctic Sciences in 2018**
- **Update on *Oden* (2018) expedition and MOSAiC (2019-2020) expedition planning**
- **STARC award - status**
- **Inter-agency reimbursement for STARC technical services on non-NSF-funded *Healy* expeditions**



The Federal Budget Cycle

Budget Process in Regular Order
(a.k.a. “how it’s supposed to work”):
Three Years, Four Phases



Phase 4: Execute the fiscal year’s budget
(not shown)

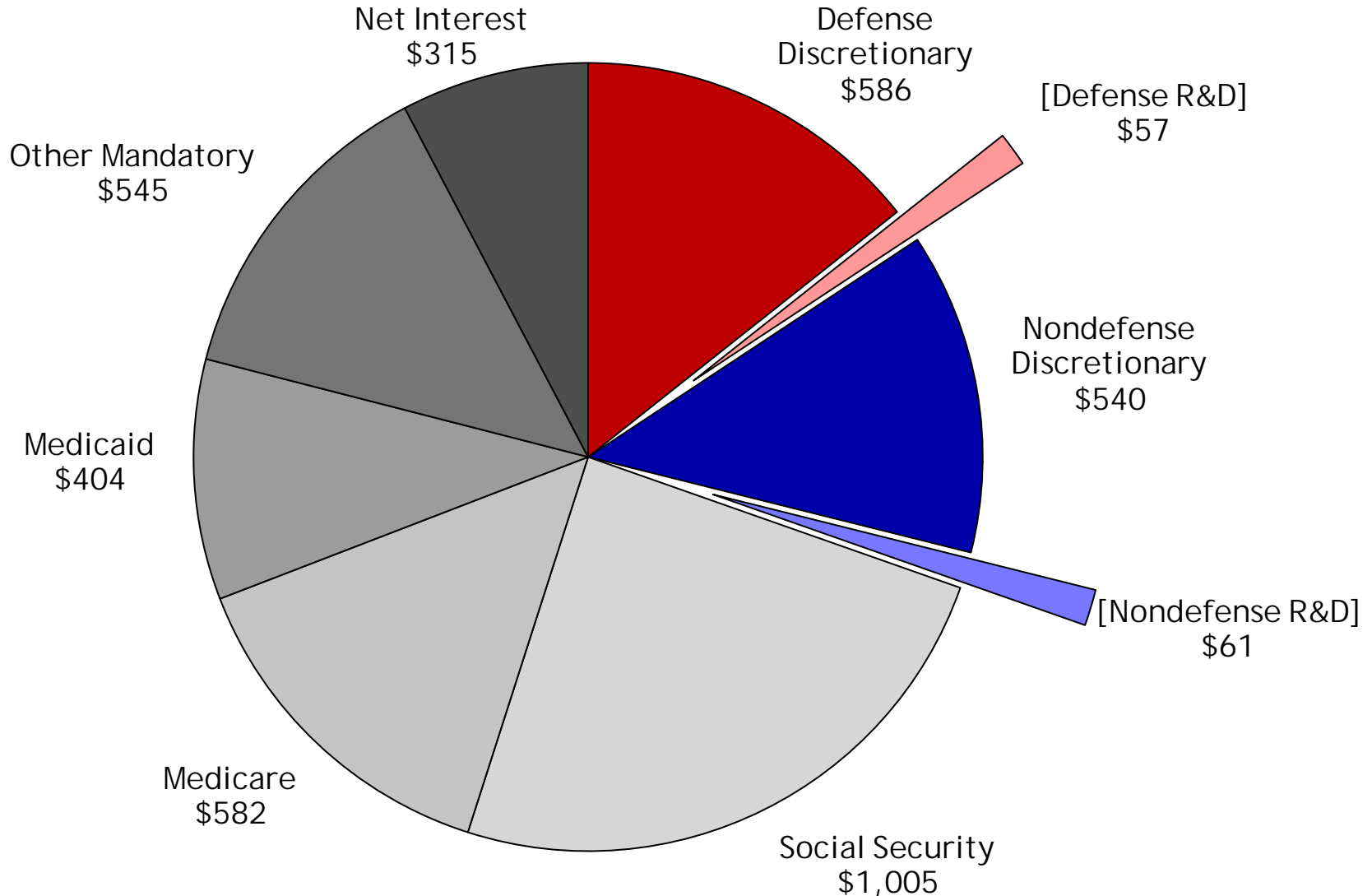
Source: AAAS R&D Budget & Policy Program presentation by Matt Hourihan (10/30/17)
<http://www.aaas.org/program/rd--budget--and--policy--program>



Composition of the Proposed FY 2018 Budget

Total Outlays = \$4.1 trillion

outlays in billions of dollars



Status of NSF's FY18 Budget

On December 22, 2017, a four week government funding bill was signed into law by President Trump. This most recent Continuing Resolution (CR) funds the government through January 19, 2018.

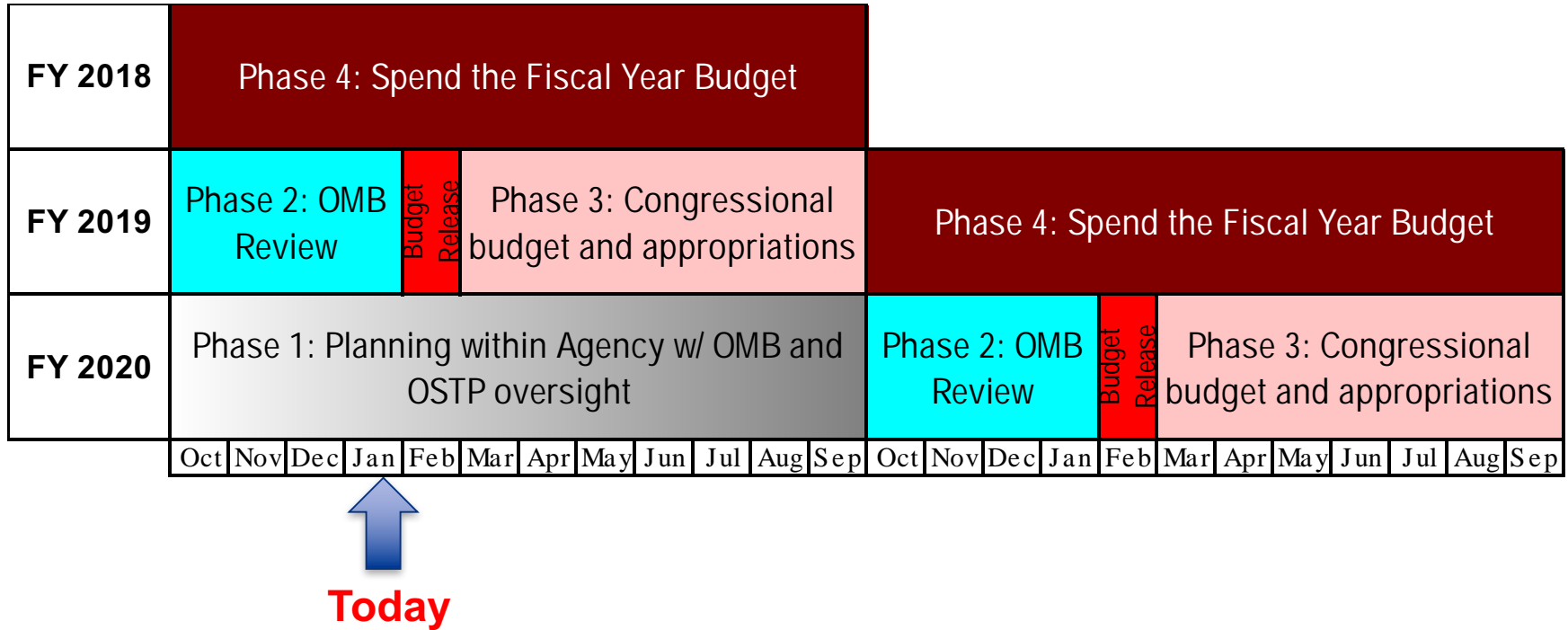
The Congress is currently working on bills to extend funding for the government through the rest of the current fiscal year (FY18).

FY18 National Science Foundation Appropriations (millions)								
Funding Line	FY16 Actual	FY17 Enacted	FY18 Request	Change 17-18	House	Change 17-18	Senate	Change 17-18
NSF	7,464	7,472	6,653	-11%	7,339	-2%	7,311	-2%
Research & Related Activities	5,998	6,034	5,362	-11%	6,034	0%	5,918	-2%

Source: American Institute of Physics – Federal Science Budget Tracker (In Progress)
<https://www.aip.org/fyi/federal-science-budget-tracker>



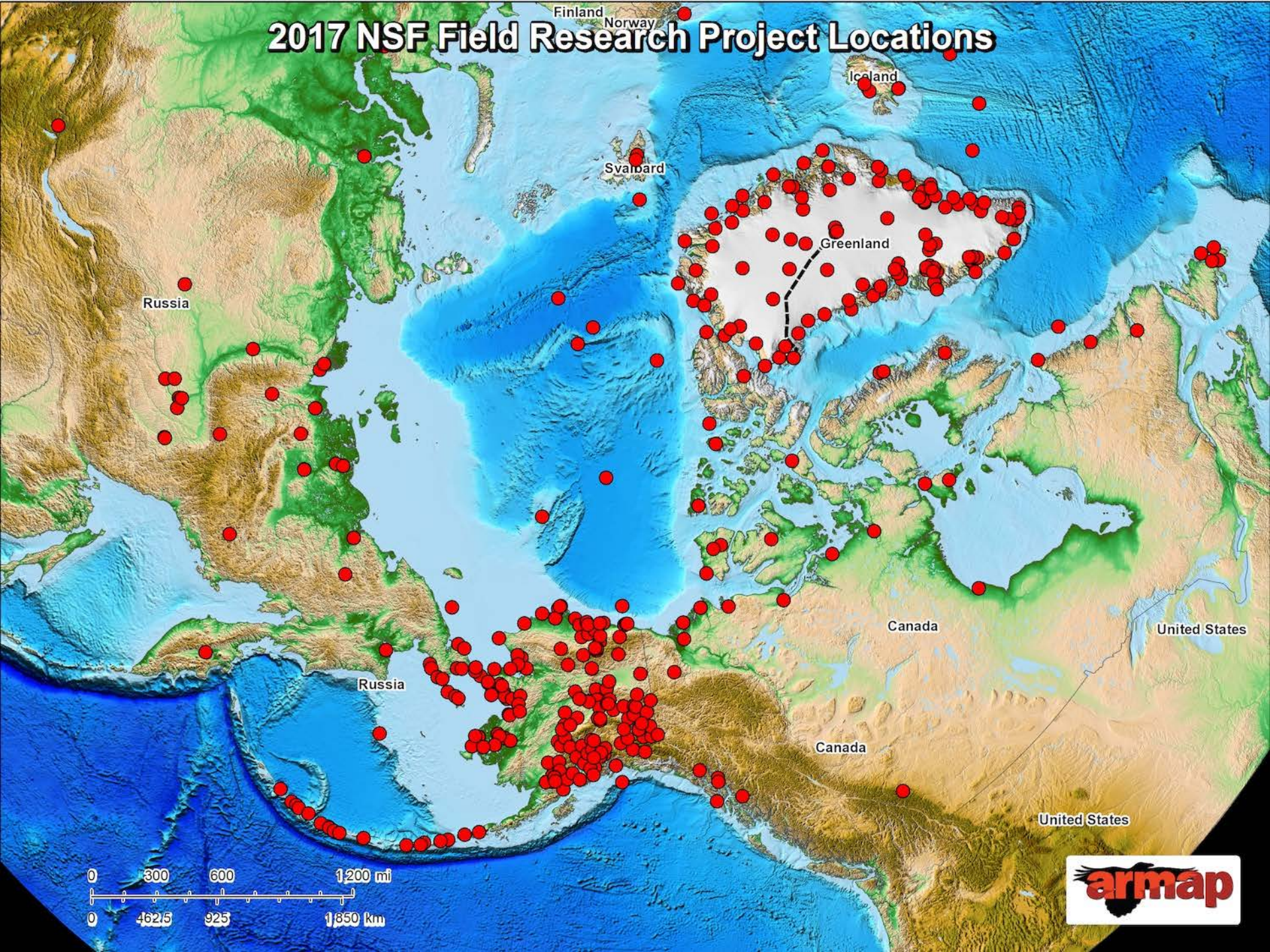
The Federal Budget Cycle



Source: AAAS R&D Budget & Policy Program presentation by Matt Hourihan (11/13/17)
<http://www.aaas.org/program/rd--budget--and--policy--program>



2017 NSF Field Research Project Locations



USCG Polar Icebreaker (PIB) Polar Star

- **Operation Deep Freeze**
 - Continued support of annual McMurdo Station channel break-in
 - 67 nautical miles of 6.5-foot ice/snow
- **New CG Polar Icebreakers (PIB)**
 - Vessel gap concerns
 - POLAR STAR lifespan 2020 – 2023
 - First PIB delivery: 2023
 - 2017 GAO Study
 - CG-proposed “Limited Service Life Extension” \$75M cost estimate/funding schedule
 - Risk Analyses
 - 2017 National Academies Study – PIB Cost Assessment
 - Recommend four heavy PIB’s, all “science ready”
 - Fourth possibly “fully science capable”; timing with HEALY replacement?

NSF-funded Alaska-region Vessel Activities



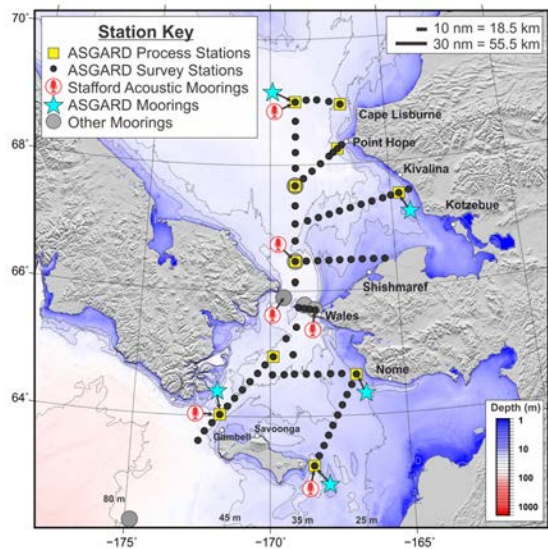
R/V Sikuliaq (UAF)

Hopcroft (UAF, PI) - NSF-OCE/BIO-DEB funding – (1656070) - Northern Gulf of Alaska Long-Term Ecological Research (NGA-LTER) – **mid-April to May 2018**

Abers (Cornell, PI) – NSF-OCE-MGG/GeoPRISMS – (1654568) - Alaska Amphibious Community Seismic Experiment (AACSE); Webb (LDEO, PI) – (1656413) – NSF-OCE-MGG/GeoPRISMS funding - Collaborative Research: Measuring strain along the Aleutian subduction zone trench to better constrain seismic and tsunami hazard – **May 2018**



Arctic & Alaska-region Vessel Activities

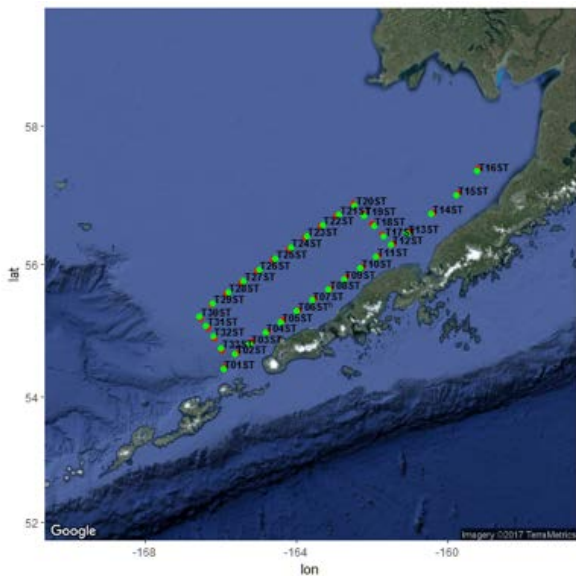


R/V Sikuliaq (UAF)

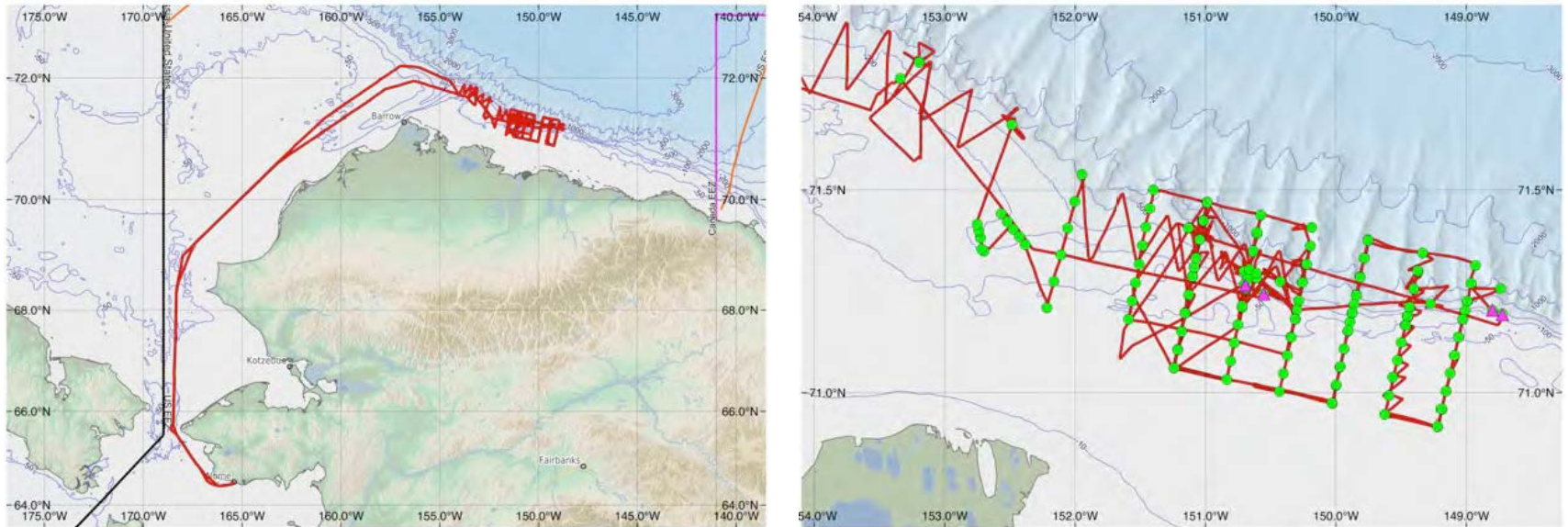
Danielson (UAF, PI) – North Pacific Research Board (NPRB) funding – Arctic Shelf Growth, Advection, Respiration and Deposition (ASGARD) – **June 2018**

Bi (UMD/CES, PI) – NSF-OPP-ANS funding – (1602488) – Bering Sea Jellyfish – **late June to early July 2018**

Abers (Cornell, PI) – NSF-OCE-MGG/GeoPRISMS – (1654568) – continued – **July 2018**



NSF-OPP-funded Arctic Vessel Activities



R/V Sikuliaq 2017 cruise track from Nome, AK and expanded view of operating area.

Ashjian (1603941) Collaborative Research: The Importance of Shelf Break Upwelling to Upper Trophic Level Ecology in the Western Beaufort Sea. – Scheduled on R/V Sikuliaq for August 2018

This collaborative project between Ashjian (1603941, Lead, WHOI), Okkonen (1603120, UAF), Campbell (1603321, URI) and Stafford (1603259, UW) will focus on the Western Beaufort Sea to quantify the importance of shelf-break upwelling to upper trophic level ecology. CPS will provide a community observer for the cruise



NSF-funded Vessel Activities in the Arctic



USCGC Healy

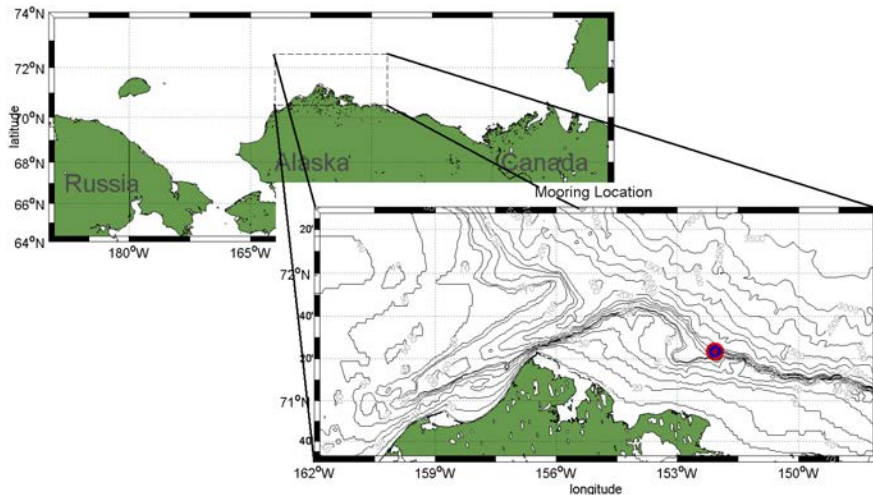
HLY18-01 (NOAA funding) – DBO-NCIS
– Pickart (WHOI, PI)

HLY18-02 (ONR funding) – SODA – Lee
(UW, PI)

**HLY18-03 (NSF funding) – Monitoring
Mooring – Pickart (WHOI, PI)**

Robert S. Pickart (1504333) - Monitoring the western Arctic boundary current in a warming climate.

Bi-annually service (deploy or turnaround or recover) a subsurface mooring on the Alaskan Beaufort shelf at 152W, and do a hydrographic survey of the boundary current. There is also ancillary mooring work that is done for other programs (including international PIs).



NSF-funded Arctic Research Vessel Activities

CCGS Sir Wilfrid Laurier

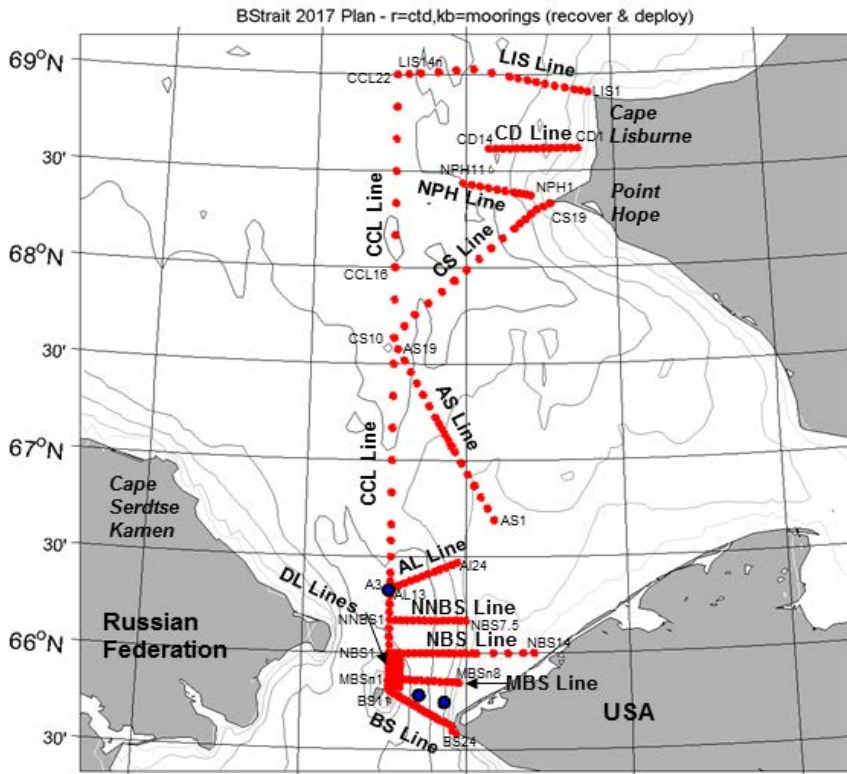
Grebmeier (UMD/CES, PI) – NSF-OPP-AON funding – (1723374) – Collaborative Research: The Distributed Biological Observatory (DBO) – A Change Detection Array in the Pacific Arctic Region– **July 2018.**



NSF-funded Arctic Research Vessel Activities

Woodgate (1304052) – NSF-OPP-AON – Bering Strait Ocean Observing System for the Pacific Inflow to the Arctic Ocean – A Fundamental Part of the Arctic Observing Network.

Figure 3: Bering Strait 2017 Plan: Black dots with blue centers – moorings to be recovered and redeployed (A2, A3, A4). Red dots – historic CTD stations. Depth contours every 10m from the International Bathymetric Chart of the Arctic Ocean [Jakobsson et al., 2000].



<http://www.norsemanmaritime.com/our-ships.html>

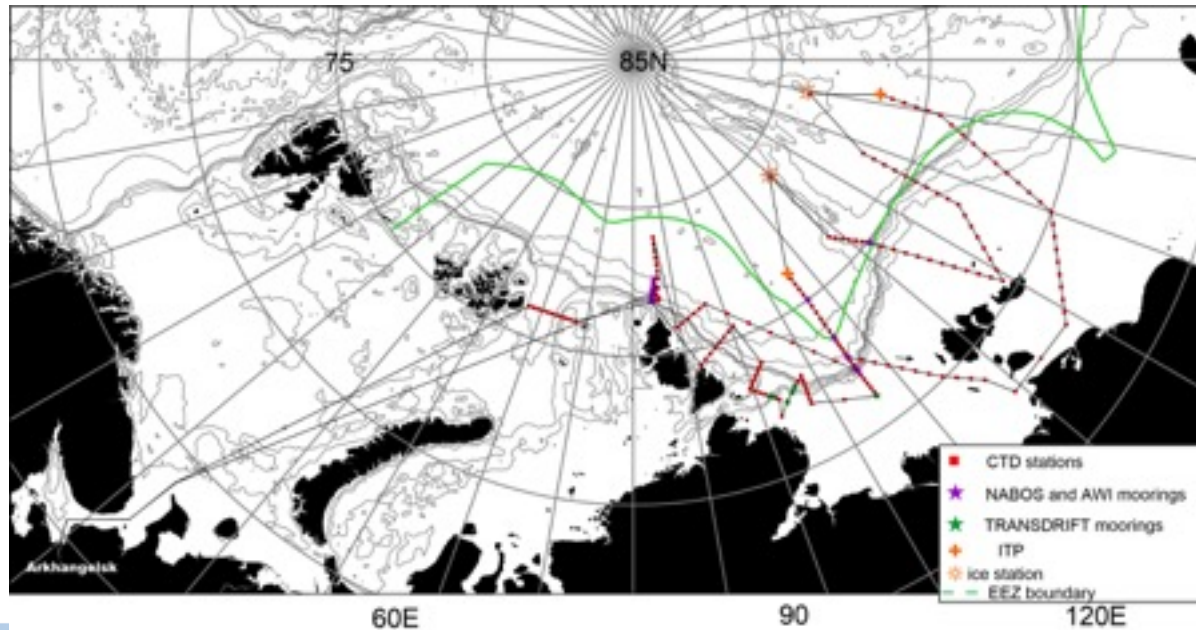


Additional Arctic Research Vessel Activities



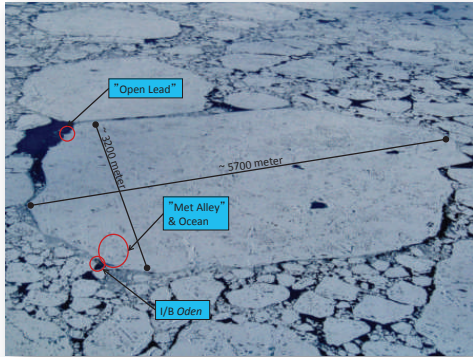
**Polyakov (PI, UAF) – (1203473)
NABOS 2018 cruise, AARI vessel
R/V Akademik Tryoshnikov**

**Expedition denied Russian
clearance in 2017; rescheduled for
2018, Russian clearance pending.**



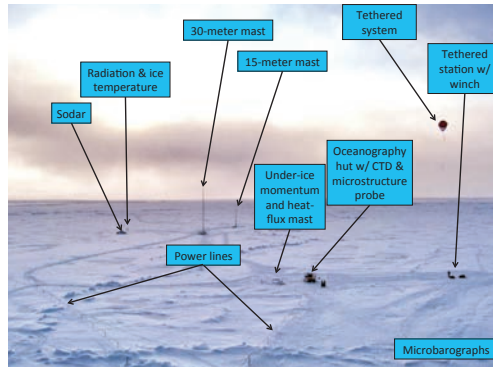
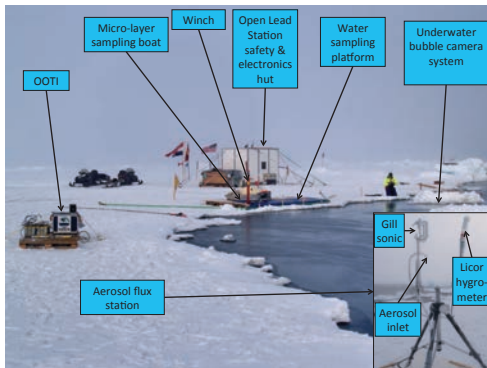
2018 ODEN Expedition

THE LIFE CYCLE OF CLOUDS WITH LINKAGES TO THE MICROBIOLOGICAL LIFE IN THE OCEAN AND ICE



- The main activities will take place during an ice-drift operation
- *Oden* will be moored to an ice floe and drift passively, during the biologically most active period into autumn freeze-up conditions, roughly August through September

17-11-19 Caroline Leck, Department of Meteorology, Stockholm University



U.S. (NSF-funded) Projects

- **Pratt, Ault** (1724585), **Grannas** (1724642), **Matrai** (1724651) - Collaborative Research: Marine Aerosols in the Arctic: Linking surface water chemistry and biology with primary particle production.
- **Shadwick, Smith** (1734786), **Deming** (1734947) - Collaborative Research: The effect of carbonate chemistry on the sea ice community in the High Arctic.
- **DiTullio, Lee** (1736783) - Microbial Oceanography Links to New aerosols in Ice-covered Regions (MjOLNIR) in the Arctic Ocean.
- **Lawler, Saltzman** (1738629) - Identifying the Origins of Summertime Arctic Cloud Condensation Nuclei Using Online Fine Aerosol Composition Measurements.



MOSAiC

The International Arctic
Drift Expedition



Markus Rex, M. Shupe, K. Dethloff
& the international MOSAiC
consortium



A major international research initiative under IASC to improve the representation of Arctic processes in weather forecast and climate models

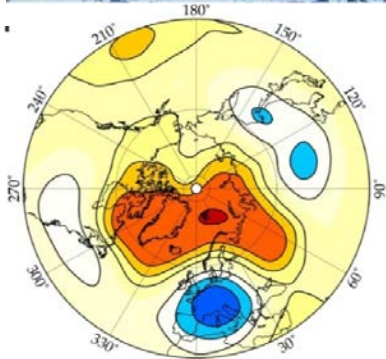
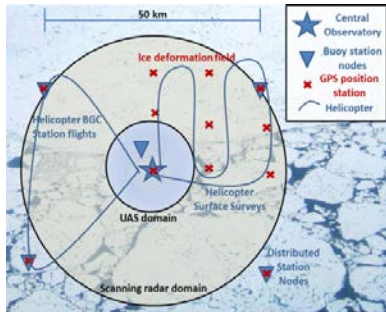


Overarching goal:

To improve the understanding and model representation of coupled atmosphere-ice-ocean-ecosystem processes in the Central Arctic to support improved sea ice forecasting, regional weather forecasting, and climate predictions.



Spatial coverage



Central Observatory

- Ship based
- Sea ice stations
- Process scale observations

< 5 km

Distributed Network

- Sea ice stations visited by helicopter
- UAV, gliders
- Process & regional model
- Model grid cell

< 50 km

Large-scale linkages

- Collaborating research vessels (Academic Tryoshnikov, Xue Long, Oden...)
- Aircraft (Polar 5,6)
- Arctic buoys, satellites
- Data assimilation studies
- Arctic regional & global models

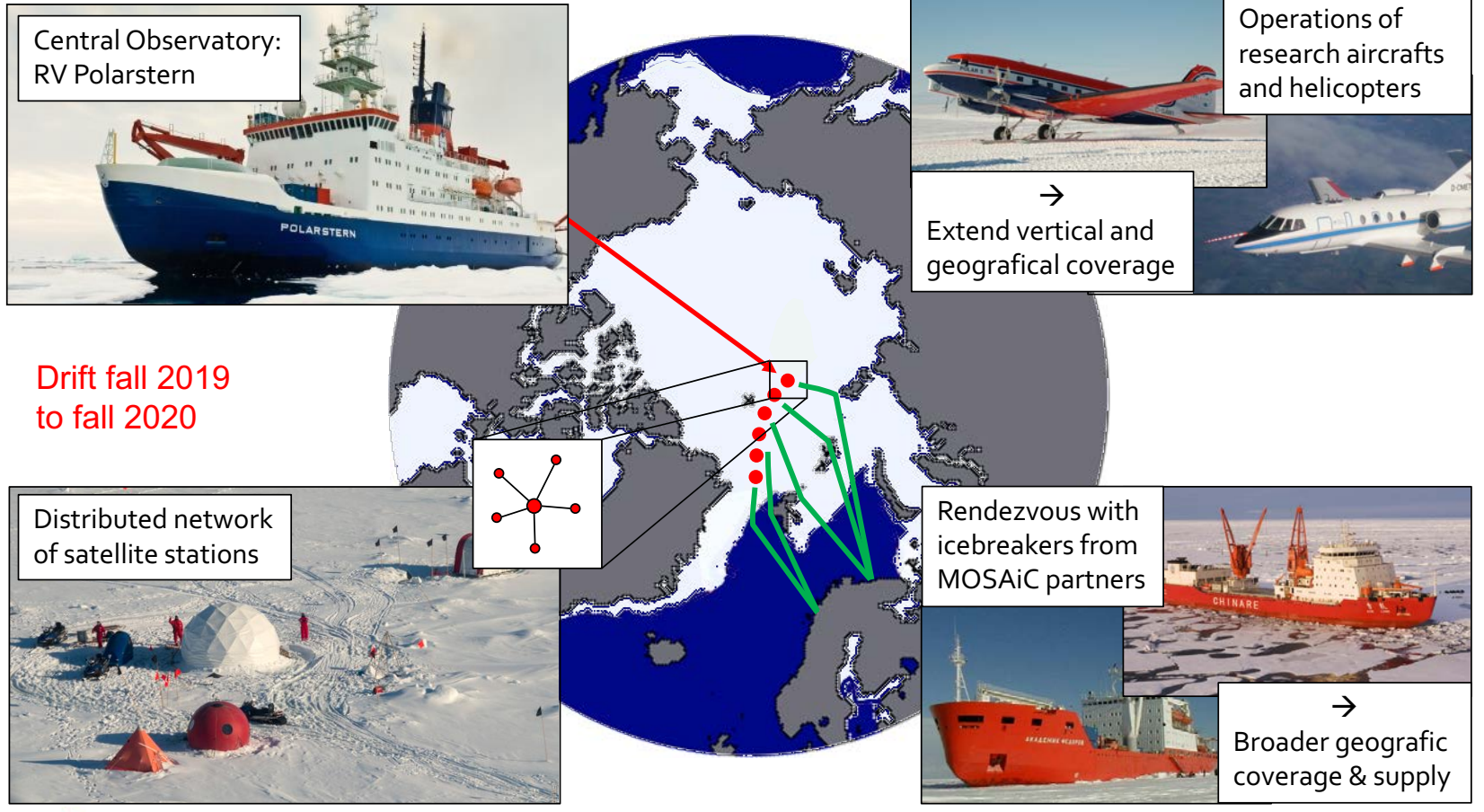
> 1000 km

MOSAiC

The International Arctic
Drift Expedition

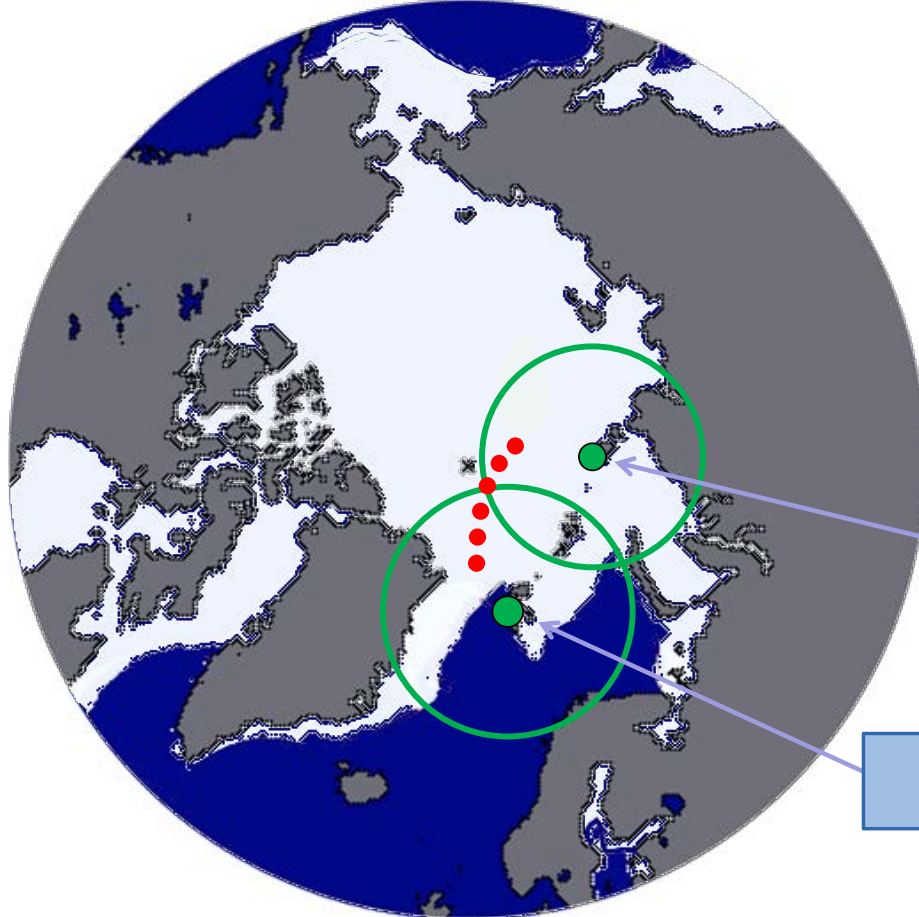


General approach





Helicopter & support aircraft



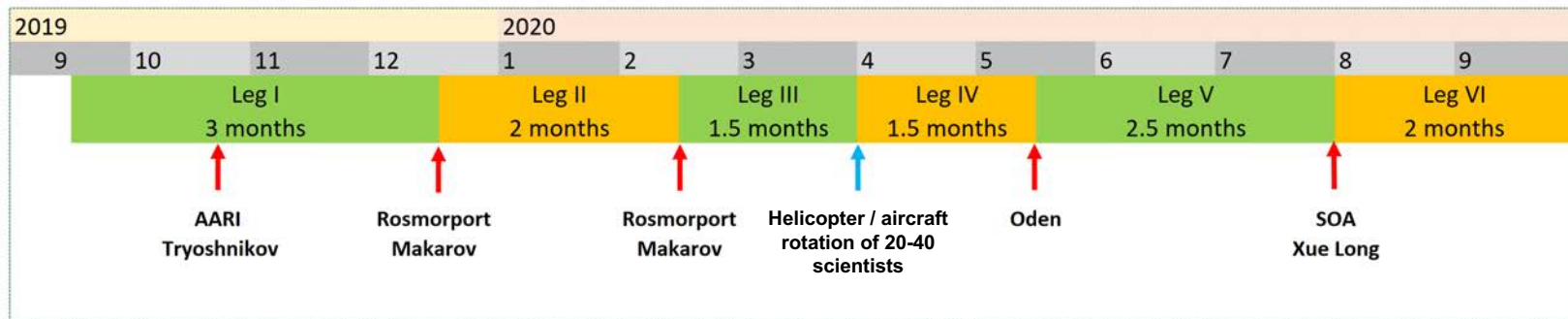
Access by Antonov flights
and/or long-distance
helicopters:

- exchanging scientific staff
- emergency operations

Via fuel depot on
Bolshevik Island

From Longyerbyen

Cruise Legs



Collaboration has been agreed with:

- AARI
- Rosmorport
- SOA
- Oden

Setup Phase

	September															Oct							
Date	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3				
Light conditions	> 4 hours of daylight (sza < 96 deg)																						
Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19				
Polarstern	Troms. Port	Troms. Port	setup	Travel to ice edge		Travel in ice								Search for floe									
Tryoshnikov				Kirk. Port	Travel to ice edge	Travel in ice together with Polarstern																	
Howercraft Plan A				Kirk. Port	On Tryoshnikov																		
Howercraft Blan B				Troms. Port	On Polarstern Helideck/On Tryoshnikov																		
Pistenbully				Kirk. Port	On Tryoshnikov																		
Equipment for network				Kirk. Port	On Tryoshnikov																		
	Oct. continued																						
Date	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Light conditions																		0-4 hours		0 hours			
Days	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Polarstern	Setup at floe										Start standard operations at floe												
Tryoshnikov	Setup at floe			Setup of Network										at floe/Travel back. Freight back?							Russian (?) Port		
Howercraft Plan A	On floe																						
Howercraft Blan B	On floe																						
Pistenbully	On floe																						
Equipment for network					Setup on ice																		

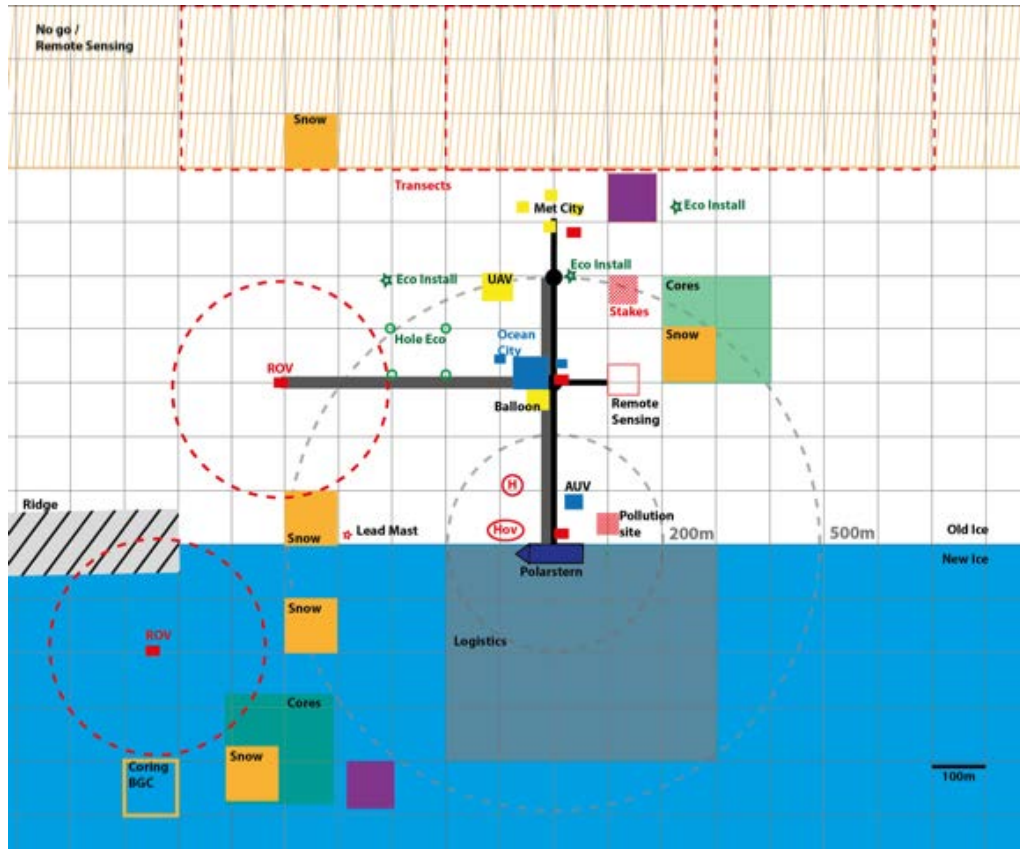
Arrival at floe
~day 19 / Oct 3

MOSAiC

The International Arctic
Drift Expedition



Setup on ice

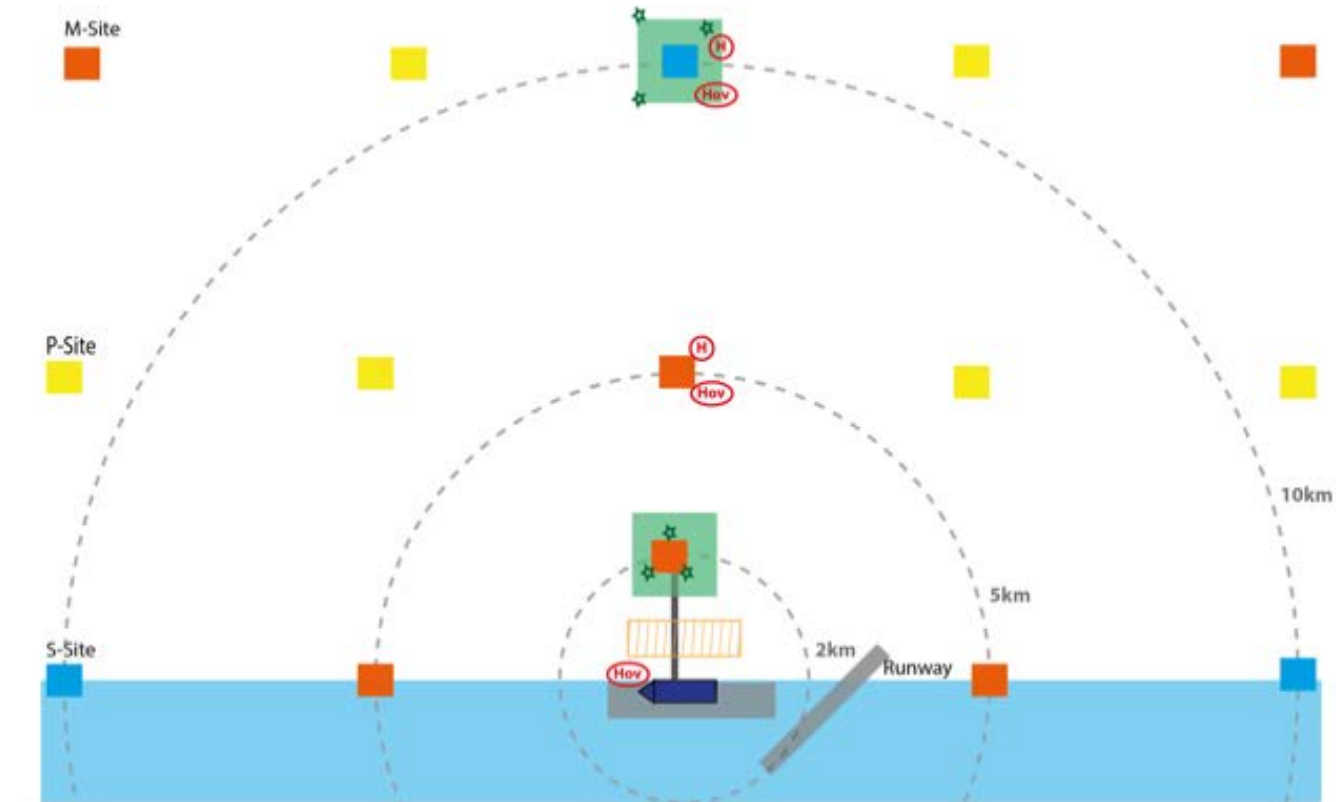


MOSAiC

The International Arctic
Drift Expedition



Remote stations



MOSAiC

The International Arctic
Drift Expedition



Participants

- 46 Total participants (plus ~50 crew)
- 8 General tasks:
 - 1 x Cruise leader
 - 1 x Chief scientist
 - 2 x Data manager
 - 2 x Safety guards
 - 2 x Media, Art, Photographer, Outreach
- 38 Scientists
 - 8 x Atmosphere
 - 5 x Ocean
 - 8 x Sea Ice
 - 4 x Biogeochemistry
 - 6 x Ecosystem
 - 7 x TBD

NSF-OPP-ARCSS-funded MOSAiC Projects

(1) Shupe (U Colorado, Boulder/CIRES, PI) **and others** – (1724551) - Collaborative Research: Thermodynamic and dynamic drivers of the Arctic sea ice mass budget at MOSAiC.

[with **Stanton**, NPS, PI (1723400); **Hutchings**, OSU, PI (1722729); **Perovich**, Dartmouth, PI (1724424)];

(2) Perovich (Dartmouth, PI) and **Polashenski** – (1724540) - Collaborative Research: Improving the Prediction of Sea Ice through Targeted Study of Poorly Parameterized Sea Ice Processes at MOSAiC and Responsive Model Development.

[with **Holland**, UCAR, PI (1724748); **Light**, UW-APL, PI (1724467)];

(3) Rember (UAF) **and others** – (1735862) – Chemical, Physical and Biological processes linking snow and sea ice to the Arctic Ocean mixed layer: Improving models through the MOSAiC platform.



Ship-based Science Technical Support in the Arctic (STARC)

- STARC Program Solicitation is currently being revised;
- RSL may request to extend current award through 2019;
- Need to coordinate with the USCG about future MOU;
- More information will be forthcoming when available.

STARC technical support costs are assessed for all non-NSF-funded cruises on a per day, per technician basis for each cruise. STARC costs for transit days to and from the operating area are assigned on a percentage basis to each cruise. Arrangements for interagency reimbursement to NSF for each cruise must be made with OPP-RSL by contacting Dr. Frank Rack (Email: frack@nsf.gov; Tel: (703) 292-2684).



Working with Indigenous Communities

- Support researcher engagement efforts in Arctic communities
 - Prior to the fieldwork to communicate project information
 - Following fieldwork to report back results
- Hire local people where feasible
- Provide polar bear guards, translators, and other field support staff from local communities
- Follow the Principles for the Conduct of Research in the Arctic



RSL Program Culture

Integrity

Respect

Transparency

Collaboration

Stewardship



Photo by Jessie Jenkins

